Using the TotalView ReplayEngine with IntelMPI

The TotalView ReplayEngine is a unique feature of TotalView that allows you to step backwards through your program to identify causes of bugs more easily. Because this is a new feature, its integration with MPI libraries currently has some issues; please use the following instructions to launch a session properly.

1.) Request a PBS graphical interactive session. For example, two Harpertown nodes (be sure to replace <SPONSOR_CODE> with the group id you use for PBS):

```
xsub -I -l
select=2:ncpus=8:proc=harp,walltime=8:00:00 -W
group_list=<SPONSOR_CODE>
```

2.) Load IntelMPI and the latest TotalView module. As of the publication of this document, "mpi/impi-3.2.011" and "tool/tview-8.6.2.2" is a combination that is well-tested.

3.) Build your application with the "-g -traceback" debug flags (and no optimization flags like -O1, -O2, -O3, or -fast).

4.) Set environment variables. For sh/ksh/bash shells:

```
export I_MPI_DEVICE=sock
export TVDSVRLAUNCHCMD=ssh
```

For csh/tcsh shells:

```
setenv I_MPI_DEVICE sock
setenv TVDSVRLAUNCHCMD ssh
```
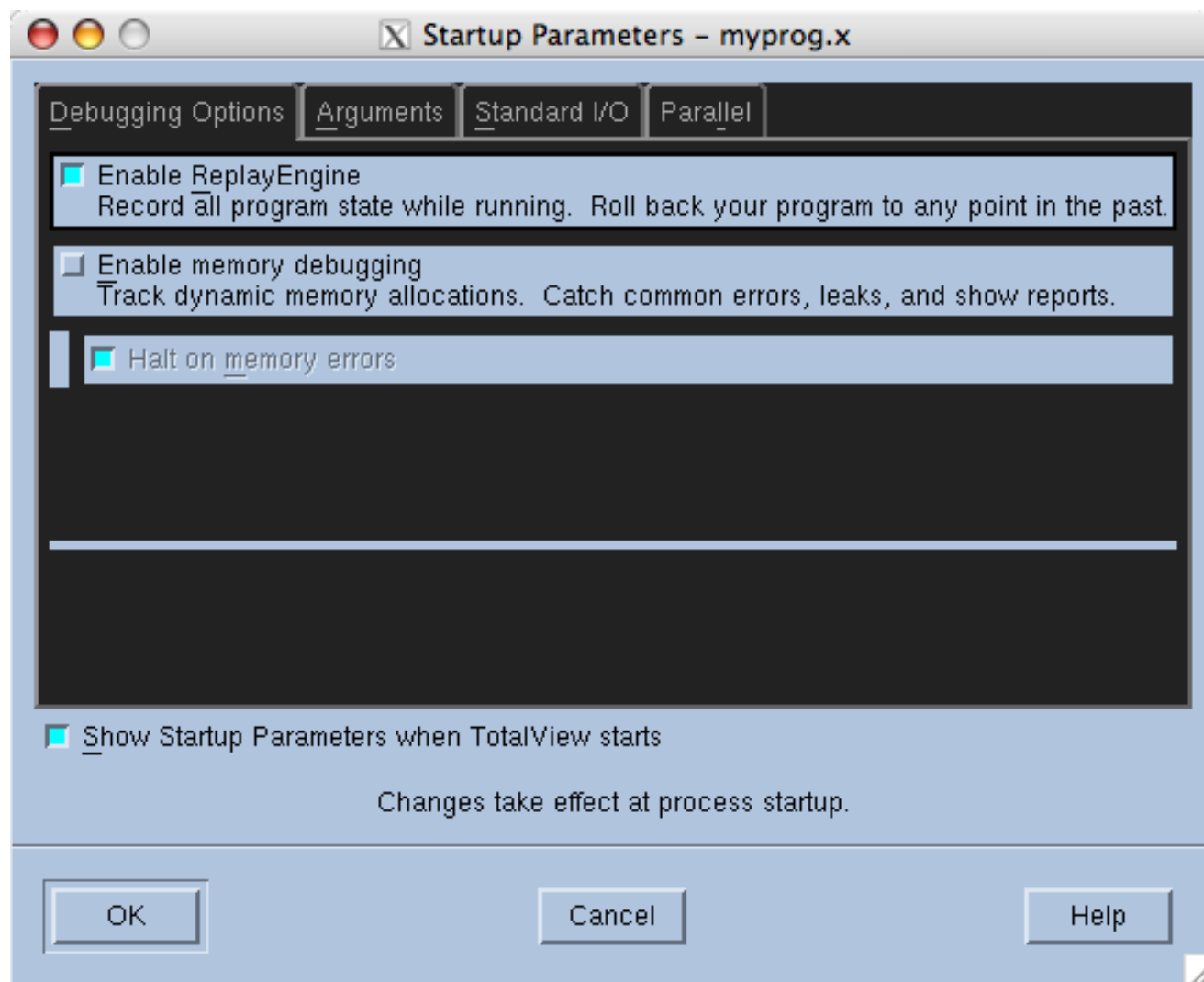
5.) Start mpdboot for your session (where <NUMBER_OF_NODES> is the number of nodes you've requested in your PBS session):
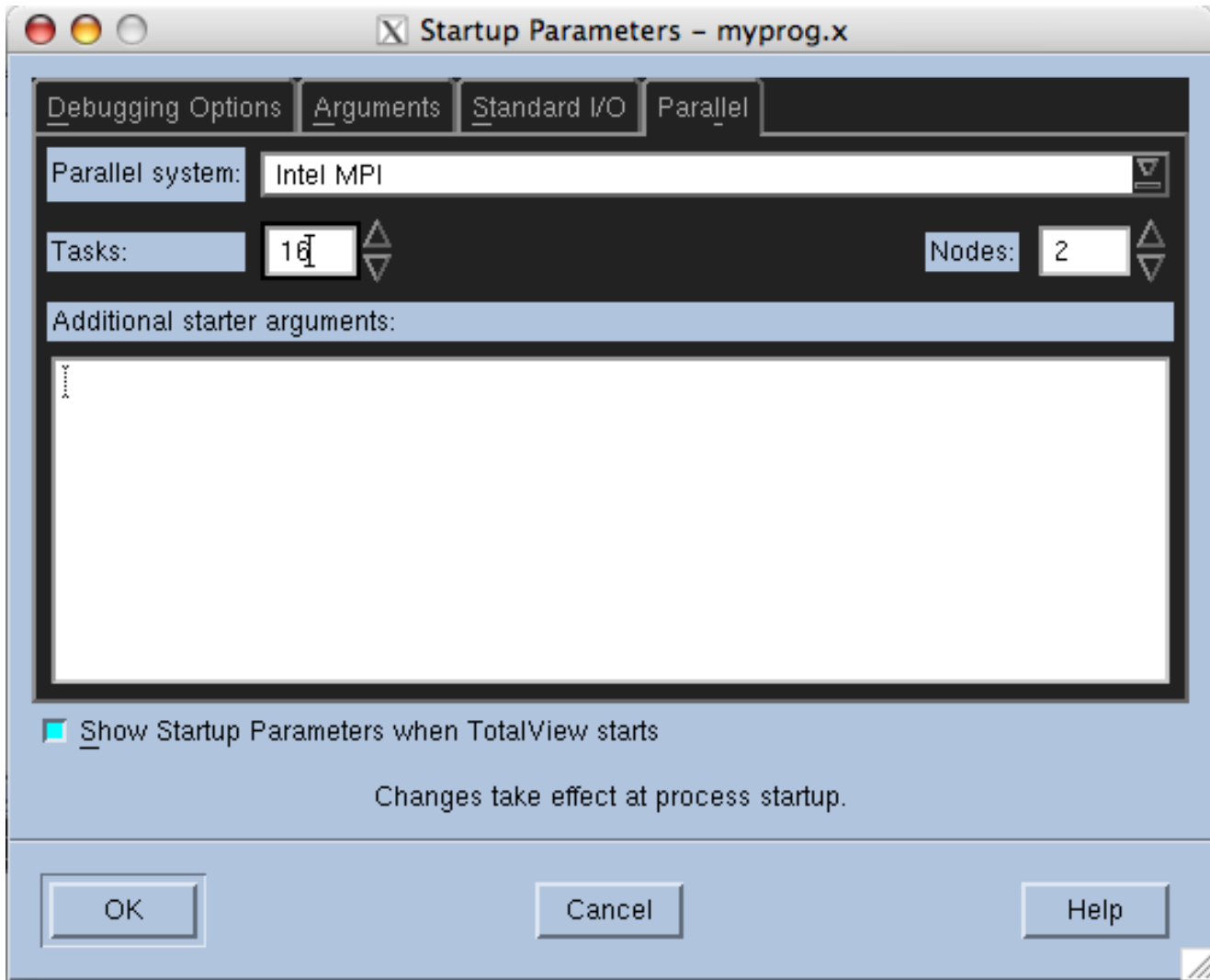
```
mpdboot -n
<NUMBER_OF_NODES> -r ssh -f $PBS_NODEFILE
```

6.) Launch Totalview with your executable:

```
totalview ./myprog.x
```

7.) In the dialog that appears, entitled "Startup Parameters - myprog.x", select the following option: "Enable ReplayEngine". Then, go to the "Parallel" tab and from the "Parallel System" drop-down menu select "Intel MPI". For "Tasks", enter the number of MPI processes you'd like to run with, and for "Nodes" enter the number of nodes you'd like to use. Select "OK" when finished.

Startup Parameters – myprog.x

Debugging Options | Arguments | Standard I/O | Parallel

Parallel system: Intel MPI

Tasks: 16   Nodes: 2

Additional starter arguments:

☑ Show Startup Parameters when TotalView starts

Changes take effect at process startup.

OK   Cancel   Help

8.) The code from your application should now be visible in the main window. Set breakpoints as you wish, and begin the run. When the code reaches a breakpoint, the ReplayEngine features should be available. The buttons on the toolbar labeled "Prev", "UnStep", and "Caller" should be active. If you select any line above the breakpoint, the "BackTo" button will become active as well. The "Live" button becomes active once you begin stepping backward through the code.

ReplayEngine features

The following is taken from documentation on Etnus's website regarding ReplayEngine features:

Prev tells ReplayEngine to display the state that existed when the previous statement executed. If that line had a function call, Prev skips over the call.

Unstep tells ReplayEngine to display the state that existed when the previous statement executed. If that line had a function call, ReplayEngine moves to the last statement in that function.

Caller tells ReplayEngine to display that state that existed before the current routine was called.

BackTo tells ReplayEngine to display the program's state for the line you select. This line must have executed prior to the currently displayed line. If you wish to move forward within replay mode, select a line and select the Run To button.

Live tells ReplayEngine to shift from replay mode to record mode. It also displays the statement that would have executed if you had not moved into ReplayMode.